ANSI/CAN/UL 15027-2:2020

JOINT CANADA-UNITED STATES
NATIONAL STANDARD

STANDARD FOR SAFETY

Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety

(ISO 15027-2:2012(E))

Approved American National Standard

ANSI/UL 15027-2-2020

Standards Council of Canada
Conseil canadien des normes

SCC FOREWORD

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

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UL Standard for Safety for Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety, ANSI/CAN/UL 15027-2

First Edition, Dated July 27, 2020

Summary of Topics

This First Edition of ANSI/CAN/UL 15027-2, Standard for Safety for Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety, has been issued to reflect the latest ANSI and SCC approval dates, and to incorporate the proposals dated June 15, 2018, June 14, 2019 and December 2, 2019.

ANSI/CAN/UL 15027-2 is an adoption with national deviations of ISO Standard for Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety, second edition of ISO 15027-2: 2012-11-01.

The requirements are substantially in accordance with Proposal(s) on this subject dated June 15, 2018, June 14, 2019 and December 2, 2019.

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JULY 27, 2020

ANSI/UL 15027-2-2020

1

ANSI/CAN/UL 15027-2:2020

Standard for Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety

First Edition

July 27, 2020

This ANSI/CAN/UL Safety Standard consists of the First Edition.

The most recent designation of ANSI/UL 15027-2 as an American National Standard (ANSI) occurred on July 27, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on July 27, 2020.

No Text on This Page

CONTENTS

Preface

This is the First Edition of the ANSI/CAN/UL 15027-2, Standard for Immersion suits – Part 2: Abandonment Suits, Requirements Including Safety.

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL 15027-2 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

To purchase UL Standards, visit the UL Standards Sales Site at http://www.shopulstandards.com/HowToOrder.aspx or call tollfree 1-888-853-3503.

This Edition of the Standard has been formally approved by the UL Standards Technical Panel (STP) on Personal Flotation Devices, STP 1123.

This list represents the STP 1123 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

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Reasons for Differences from ISO

National Differences from the ISO standard are being added in order to address regulatory and safety situations present in the US and Canada.

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NATIONAL DIFFERENCES

There are six types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences. The National Differences in this standard were developed via a binational effort by the Canada / US 15027 Task Group.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from ISO requirements based on existing safety practices. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the component standards and will not be deleted until a particular component standard is harmonized with the ISO component standard.

DE – These are National Differences based on **editorial comments or corrections**. Some examples of editorial comments or corrections include replacing "lifejacket" with "PFD" or vice versa and correcting paragraph references.

DT – These are National Differences that are the result of pending changes that have been tentatively agreed internationally by ISO TC188/SC1 for the next edition of the standard and therefore are expected outcomes of the second edition of ISO 15027. These changes include both clarifications and substantive changes in requirements and that will be reviewed when the next edition of ISO 15027 is published.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base ISO text:

Addition / Add – An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base ISO text.

Modification / Modify – A modification is an altering of the existing base ISO text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base ISO text.

Deletion / Delete – A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

No Text on This Page

Foreword (ISO)

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15027-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets*, in collaboration with Technical Committee ISO/TC 188, *Small craft*, Subcommittee SC 1, *Personal safety equipment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 15027 2:2002), which has been technically revised. The main technical changes are:

a) addition of terms and definitions from ISO 15027-1:2012;

b) revision of requirements for buddy lines;

c) revision of requirements regarding conspicuity;

d) addition of Clause 6 "Information supplied by the manufacturer";

e) revision of consumer information label;

f) revision of requirements regarding thermal protection in water.

ISO 15027 consists of the following parts, under the general title *Immersion suits*:

– *Part 1: Constant wear suits, requirements including safety*

– *Part 2: Abandonment suits, requirements including safety*

– *Part 3: Test methods*

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Introduction

This part of ISO 15027 has been prepared to meet the needs of persons engaged in certain activities on or near water. Abandonment suits manufactured and maintained according to this part of ISO 15027 will provide protection from cold shock and delay the onset of hypothermia.

The complete immersion system (suit and clothes worn under the suit) should be able to keep the user alive long enough for the rescue services to find and recover them. An individual's estimated thermal protection time will depend on water temperature and wave state as well as their physiology. Detailed in this part of ISO 15027 are the minimum recommended insulation levels and the associated water temperatures in which they are to be used.

This part of ISO 15027 is intended to serve as a minimum performance requirement for manufacturers, purchasers and users of such safety equipment and seeks to ensure that the equipment provides effective performance in use. The abandonment suit should not jeopardize safety by causing undue discomfort which could result in a degradation of performance.

The abandonment suit shall have no features which will be likely to have any detrimental effect on the operation of other life-saving equipment that may be used. In particular, any part of the suit which might pose a snagging hazard shall be suitably covered, protected or restrained.

The primary aims in wearing an abandonment suit are:

a) to reduce the risk of cold shock and delay the onset of hypothermia;

b) to enable the user to propel himself in the water and extricate himself from the water without it becoming an encumbrance;

c) to make the user sufficiently conspicuous in the water so as to aid his recovery.

Many circumstances may alter the performance of the suit, such as wave action or the wearing of additional equipment. Users, owners and employers should ensure that equipment is correctly maintained according to the manufacturer's instructions.

An abandonment suit may often be worn with a lifejacket as it will provide extra flotation and may help to bring a user to a face-up position.

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1 Scope

This part of ISO 15027 specifies performance and safety requirements for abandonment suits in emergency situations in work and leisure activities to protect the body of a user against the effects of cold water immersion, such as cold shock and hypothermia, including head, hand and feet protection.

1DV D2 *Modification by revising the first paragraph of clause 1 by replacing the text with:*

This part of ISO 15027 specifies performance and safety requirements for abandonment suits and suit systems in emergency situations in work and leisure activities to protect the user against the effects of cold water immersion, by reducing cold shock and delaying the onset of hypothermia and providing stable face-up flotation.

It is applicable for dry and wet abandonment suits.

It is applicable for dry and wet abandonment suits.

1DV.1 D2 *Modification by deleting the second paragraph*

Constant wear suits are not covered by this part of ISO 15027. The requirements of constant wear suits are given in ISO 15027-1:2012. Test methods are given in ISO 15027-3:2012.

1DV.2 D2 *Modification by adding a new paragraph*

Where references are made to ISO 15027 standards or ISO 12402 standards, they shall be considered to be to ANSI/CAN UL 15027 with the applicable Canadian /US National Differences where UL Standards exist. Where references are made to particular requirements within a part, they shall include the associated DVs contained in that standard, as applicable.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CIE 15:2004, *Colorimetry*[1]

[1] Available from http://www.cie.co.at/main/publist.html.

EN 340, *Protective clothing – General requirements*

ISO 105-A02, *Textiles – Tests for colour fastness – Part A02: Grey scale for assessing change in colour*

ISO 105-E02, *Textiles – Tests for colour fastness – Part E02: Colour fastness to sea water*

ISO 105-X12, *Textiles – Tests for colour fastness – Part X12: Colour fastness to rubbing*

ISO 188, *Rubber, vulcanized or thermoplastic – Accelerated ageing and heat resistance tests*

ISO 1421, *Rubber- or plastics-coated fabrics – Determination of tensile strength and elongation at break*

ISO 2411:2000, *Rubber- or plastics-coated fabrics – Determination of coating adhesion*

ISO 3801:1977, *Textiles – Woven fabrics – Determination of mass per unit length and mass per unit area*

ISO 4674-1:2003, *Rubber- or plastics-coated fabrics – Determination of tear resistance – Part 1: Constant rate of tear methods*

ISO 7854:1995, *Rubber- or plastics-coated fabrics – Determination of resistance to damage by flexing*

ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests*

ISO 12401, *Small craft – Deck safety harness and safety line – Safety requirements and test methods*

ISO 12402-2, *Personal flotation devices – Part 2: Lifejackets, performance level 275 – Safety requirements*

ISO 12402-3, *Personal flotation devices – Part 3: Lifejackets, performance level 150 – Safety requirements*

ISO 12402-4, *Personal flotation devices – Part 4: Lifejackets, performance level 100 – Safety requirements*

ISO 12402-5, *Personal flotation devices – Part 5: Buoyancy aids (level 50) – Safety requirements*

ISO 12402-6, *Personal flotation devices – Part 6: Special purpose lifejackets and buoyancy aids – Safety requirements and additional test methods*

ISO 12402-7:2006, *Personal flotation devices – Part 7: Materials and components – Safety requirements and test methods*

ISO 12402-8, *Personal flotation devices – Part 8: Accessories – Safety requirements and test methods*

ISO 12402 9:2006, *Personal flotation devices – Part 9: Test methods*

ISO 13934-1, *Textiles – Tensile properties of fabrics – Part 1: Determination of maximum force and elongation at maximum force using the strip method*

ISO 13935-2, *Textiles – Seam tensile properties of fabrics and made-up textile articles – Part 2: Determination of maximum force to seam rupture using the grab method*

ISO 15027-3:2012, *Immersion suits — Part 3: Test methods*

Resolution A.658 (16) [2] adopted by the IMO[3] Assembly to amend the International Convention for the Safety of Life at Sea (SOLAS), 1974, *Use and fitting of retro-reflective materials on life-saving appliances*

[2] Accessible at http://www.imo.org/KnowledgeCentre/HowAndWhereToFindIMOInformation/IndexofIMOResolutions/Pages/Assembly-(A).aspx.

[3] IMO is the abbreviation for International Maritime Organization. It is based in London, UK. IMO issues regulations which are then published as laws by the member states.

2DV D2 ***Modification of Clause 2 by adding the following:***

ANSI/CAN/UL 1191, ***Components for Personal Flotation Devices***

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
immersion suit
suit designed to protect the user's body from the cooling effects of unintended immersion in water

Note 1 to entry: Cooling effects include cold shock (3.21) and hypothermia (3.14).

[SOURCE: ISO 15027-1:2012, 3.1]

3.2
constant wear suit
immersion suit designed to be routinely worn for activities on or near water in anticipation of accidental immersion in water, but permitting physical activity to such an extent that actions can be undertaken without undue encumbrance and thus, head, hands and feet need not be covered

[SOURCE: ISO 15027-1:2012, 3.2]

3.3
abandonment suit
immersion suit including head, hand and feet protection designed to permit rapid donning in the event of an imminent immersion in water

[SOURCE: ISO 15027-1:2012, 3.3]

3.4
dry suit
immersion suit designed to protect the user against the effect of cold water immersion by precluding the entry of water upon immersion

[SOURCE: ISO 15027-1:2012, 3.4]

3.5
wet suit
immersion suit designed to protect the user against the effect of cold water immersion by providing insulation and limiting the entry and exit of water upon immersion

[SOURCE: ISO 15027-1:2012, 3.5]

3.6
primary suit closure
closure used in the donning of the suit

[SOURCE: ISO 15027-1:2012, 3.6]

3.7
secondary suit closure
additional closure which can be operated by the user to enhance the fit of the suit

[SOURCE: ISO 15027-1:2012, 3.7]

3.8
inherent buoyant material
material that provides buoyancy, forming a permanent part of the suit, with a density less than that of water

[SOURCE: ISO 15027-1:2012, 3.8]

3.8DV D2 ***Modification of clause 3.8 by deleting.***

3.9
exterior fabric
outer fabric of a suit, either in the form of a single or composite fabric

[SOURCE: ISO 15027-1:2012, 3.9]

3.10
retro reflective material
material that reflects light beams back to their point of origin

[SOURCE: ISO 15027-1:2012, 3.10]

3.11
sprayhood
cover brought or placed in front of the face of the user in order to reduce or eliminate the splashing of water from waves or the like onto the airways, and thereby promoting the survival of the user in rough water conditions

[SOURCE: ISO 15027-1:2012, 3.11]

3.12
buddy line
length of cord which can be tied or otherwise fixed to another person, or to that person's personal flotation device or other objects, so as to keep a user in the vicinity of that person or object with a view to making location and thus rescue easier

[SOURCE: ISO 15027-1:2012, 3.12]

3.13
clo value
unit to express the relative thermal insulation values of various clothing assemblies

Note 1 to entry: One clo is equal to 0,155 $Km^2 W^{-1}$.

[SOURCE: ISO 15027-1:2012, 3.13]

3.14
hypothermia
condition where body core temperature is below 35 °C

[SOURCE: ISO 15027-1:2012, 3.14]

3.15
working environment
environment in which the user of a suit system would engage in normal work

[SOURCE: ISO 15027-1:2012, 3.15]

3.16
helicopter transit suit
constant wear suit worn by helicopter occupants

[SOURCE: ISO 15027-1:2012, 3.16]

3.17
offshore installation
structure or vessel that is permanently or temporarily sited at sea or away from the shore in a fresh water lake or river and which is not covered under other international regulations

[SOURCE: ISO 15027-1:2012, 3.17]

3.18
suit system
combination of a suit and any other products which are used in conjunction with it

[SOURCE: ISO 15027-1:2012, 3.18]

3.18DV D2 ***Modification of clause 3.18 to revise definition as follows:***

combination of a suit and any other products which are used in conjunction with it (e.g. auxiliary buoyancy, buoyancy aids, lifejackets, or accessories)

3.19
underclothing
clothes worn under the suit system

[SOURCE: ISO 15027-1:2012, 3.19]

Note 1 to entry: The underclothing to be worn with the suit system shall be specified by the manufacturer. If not specified by the manufacturer, it shall be according to ISO 15027-3:2012, 3.8.1.3.

3.19DV D2 ***Modification of clause 3.19 to revise definition as follows:***

test clothing
clothes worn under the suit system

[SOURCE: ISO 15027-1:2012, 3.19]

Note 1 to entry: The test clothing to be worn with the suit system shall be specified by the manufacturer. If not specified by the manufacturer, it shall be according to ISO 15027-3:2012, 3.8.1.3.

3.20
heat strain
increase of body temperature induced by sustained heat stress which cannot be fully compensated by temperature regulation, or activation of thermoeffective activities in response to heat stress which cause sustained changes in the state of other, nonthermal, regulatory systems

[SOURCE: ISO 15027-1:2012, 3.20]

3.21
cold shock
short transitory phase lasting about 2 to 3 min upon sudden immersion in cold water and characterized by an uncontrollable hyperventilation accompanied by other cardio-respiratory distress

[SOURCE: ISO 15027-1:2012, 3.21]

3.22DV D2 *Modification by adding auxiliary buoyancy definition to clause 3:*

auxiliary buoyancy
buoyancy not relied upon to meet the buoyancy requirements of this standard

3.23DV D2 *Modification by adding structural parts, materials, and components definition to clause 3:*

structural parts, materials, and components
parts, materials, or components that are integral to the device and that are essential for its correct function and performance

4 Requirements

4.1 General

4.1.1 The suit system declared to be an abandonment suit shall meet all requirements of this part of ISO 15027. The suit shall not be damaged or fail in its determined function when tested in accordance with all tests in ISO 15027-3:2012, Clause 3. The test sequence shall start with the temperature cycling in accordance with ISO 15027-3:2012, 3.9, followed by the rotating shock bin test in accordance with ISO 15027-3:2012, 3.6.

4.1.1DV D2 *Modification of clause 4.1.1 by revising as follows:*

The suit system declared to be an abandonment suit shall meet all requirements of this part of ISO 15027. The suit system shall not be damaged or fail in its determined function when tested in accordance with all tests in ISO 15027-3:2012, Clause 3. The test sequence shall start with the temperature cycling in accordance with ISO 15027-3:2012, 3.9, followed by the rotating shock bin test in accordance with ISO 15027-3:2012, 3.6.

4.1.1DV.1 D2 ***Modification of clause 4.1.1 by adding the following paragraph:***

When a lifejacket/auxiliary buoyancy is part of the suit system, it shall be tested and included as part of the suit system. In addition for a Class A and Class B suit, the lifejacket/auxiliary buoyancy shall also be mechanically attached to the suit.

4.1.2 The manufacturer shall specify the components of the suit system including underclothing and additional items. The abandonment suit shall cover the whole body with the exception of the face. The hood shall make a tight fit around the face to limit water ingress. Hand covering shall be provided either by integral hand protection or by permanently attached hand protection/gloves. Test by visual inspection.

4.1.2DV.1 D2 ***Modification of clause 4.1.2 by revising first paragraph as follows:***

The manufacturer shall specify the components of the suit system including underclothing and additional items. The abandonment suit shall cover the whole body with the exception of the face. Hand covering shall be provided either by integral hand protection or by permanently attached hand protection/gloves.

The abandonment suit may incorporate additional items compliant with ISO 12402-8, none of which shall impair its performance with respect to the requirements of this part of ISO 15027, either by their presence or their use.

4.1.2DV.2 D2 ***Modification of clause 4.1.2 by revising second paragraph as follows:***

The abandonment suit system may incorporate additional items or accessories compliant with 4.3 below and ISO 12402-8, none of which shall impair its performance with respect to the requirements of this part of ISO 15027, either by their presence or their use.

4.1.2DV.3 D2 ***Modification of clause 4.1.2 by adding the following:***

Additional Suit System Components – The suit system may incorporate additional components not covered by this standard. Additional components shall be tested as part of the suit system and shall not impair the suit system's performance. This standard does not test the functionality of these additional components. Components shall comply with ANSI/CAN/UL 1191 and shall be marked as specified therein.

4.1.3 The risk of heat stress and discomfort shall be taken into account in the design and use of the suit system. This should be accompanied in the information supplied by the manufacturer by specific advice or warnings according to Clause 6.

NOTE In general, the higher the protection against cold shock and hypothermia, the higher is the possibility of heat strain. The user of an abandonment suit needs to balance those two effects when choosing a device.

4.1.4 The size of the suit shall fit size(s) of the intended user(s). When multiple size ranges are provided, the size ranges should overlap. If an adult universally sized suit is provided, it shall be sized to fit at least every person between 1,50 m and 1,95 m. Test in accordance with ISO 15027-3:2012.

4.1.4DV D2 *Modification to revise clause 4.1.4 by replacing with the following:*

4.1.4DV.1 The size of the suit shall fit size(s) of the intended user(s). Multiple size ranges shall comply with Table 1DV.

Table 1DV

	Standard Child	Standard Adult Small	Universal Adult	Standard Adult Jumbo	[Custom]/ Individual Size
Mass (kg)	18 to 50	40 – 100	50 to 150	Greater than 100	To be specified by manufacturer
Height (m)	1.0 to 1.5	1.2 – 1.7	1.5 to 2.0	1.7 – 2.2	To be specified by manufacturer

4.1.5 The rotating shock bin test according to ISO 15027-3:2012, 3.6 shall be performed on each suit before performing the relevant tests according to ISO 15027-3:2012, Clause 3. There shall be no visible migration of insulation material and no visible wear-and-tear damage after the rotating shock bin test.

4.1.6 Unless the suit system has been designed to be used without a PFD, the suit system shall not prevent the donning of a personal flotation device (PFD) in accordance with ISO 12402-2 or ISO 12402-3, and the manufacturer of the suit system shall specify the type of PFD (inflatable and/or inherent) to be used.

4.1.6DV D2 *Modification of clause 4.1 to add 4.1.6DV.1 as follows:*

4.1.6DV.1 If the suit system has been designed to include auxiliary buoyancy, it shall be tested in accordance with ISO 12402-5 section 5.3.

4.1.7 The performance requirements shall be met after cleaning in accordance with ISO 15027- 3:2012, 3.7.1.1. The cleaning shall be performed according to the specification of the manufacturer.

4.1.8 The suit system shall be designed in such a way as to minimize the risk of snagging in accordance with ISO 15027-3:2012, 3.1.

4.1.8DV D2 *Modification of clause 4.1.8 by replacing with the following:*

4.1.8DV.1 The suit system shall be designed in such a way as to minimize the risk of snagging when tested in accordance with ISO 15027-3:2012, 3.10.

4.1.8DV.2 The suit system shall be designed so as not to impede the user during normal use when tested in accordance with ISO 15027-3:2012, 3.10.

4.1.9 Materials, fabrics and components shall conform with the requirements of 4.11.

4.1.9DV D2 *Modification of clause 4.1.9 by replacing with the following:*

4.1.9DV.1 Materials, fabrics and components shall conform to the requirements of ANSI//UL 1191.

4.1.10 The suit shall not contain or be accompanied by any component likely to injure or impede the user within the context of normal use. Test in accordance with ISO 15027-3:2012, 3.10.

4.1.10DV DE *Modification of clause 4.1.10 by replacing with the following:*

4.1.10DV.1 The suit system shall not contain or be accompanied by any component likely to injure or impede the user within the context of normal use when tested in accordance with ISO 15027-3:2012, 3.10.

4.1.11 A dry suit requires a tight fit around neck or face, wrists and ankles.

4.1.11DV D2 *Modification of clause 4.1.11 by deleting.*

4.2 Basic health and ergonomic requirements

4.2DV D2 *Modification of title of clause 4.2 to replace with the following:*

4.2DV Ergonomic requirements

4.2.1 Innocuousness

The suit system shall not adversely affect the health or hygiene of the user. The materials shall not, in the foreseeable conditions of normal use, release substances generally known to be toxic, carcinogenic, mutagenic, allergenic, toxic to reproduction or otherwise harmful.

NOTE 1 More information can be found in ISO 13688.

NOTE 2 Materials should be selected to minimize the environmental impact of the production and disposal of protective clothing (see ISO 13688: Annex F).

The examination, in combination with the following requirements in 4.2, shall determine whether the claim that the materials are suitable for use in the protective clothing or protective equipment is justified. Particular attention has to be paid to the presence of plasticizers, unreacted components, heavy metals, impurities and the chemical identity of pigments and dyes.

4.2.1DV D2 *Modification of clause 4.2.1 by deleting:*

4.2.2 Design

4.2.2DV D2 *Modification of title of clause 4.2.2 to replace with the following:*

4.2.2DV Design and construction

4.2.2.1 The design of the suit system shall facilitate its correct positioning on the user and shall ensure that it remains in place for the foreseeable period of use, taking into account ambient factors, together with the movements and postures that the wearer could adopt during the course of work or other activity. For this purpose, appropriate means, such as adequate adjustment systems or adequate size ranges shall be provided so as to enable protective clothing to be adapted to the morphology of the user.

4.2.2.1DV D2 *Modification of clause 4.2.2.1 by replacing with the following:*

The design of the suit system shall facilitate its correct positioning on the user and shall ensure that it remains in place for the foreseeable period of use, taking into account ambient factors, together with the movements and postures that the wearer could adopt during the course of work or other activity. For this purpose, appropriate means, such as adequate adjustment systems or adequate size ranges shall be provided so as to enable the suit system to be adapted to the morphology of the user.

4.2.2.2 The design shall ensure that no parts of the body get uncovered by expected movements by the user. When testing according to ISO 15027-3:2012, 3.10 it shall be proven that

– the suit system can be put on and taken off easily,

– arm and knee and bending movements are possible,

– unprotected body areas do not appear during movements, and

– the manufacturer's information is adequate to explain the correct usage.

4.2.2.2DV D2 *Modification of clause 4.2.2.2 by deleting*

4.2.2.3 The design of the suit system shall take into account other additional items to be worn with it. The appropriate level of protection shall be provided at interface areas, for example sleeve to glove, trouser to footwear, hood and respirator combinations. There may be other combinations.

4.2.2.3DV D2 *Modification of clause 4.2.2.3 by deleting*

4.2.2.4 The suit system shall not

– have rough, sharp or hard surfaces that irritate or injure the user;

– be so tight, loose and/or heavy that it restricts normal movement.

4.2.2.4DV D2 *Modification of clause 4.2.2.4 to replace with the following:*

4.2.2.4DV.1 The suit system shall be constructed not to:

– have rough, sharp or hard surfaces that irritate or injure the user;

– be so tight, loose and/or heavy that it restricts normal movement.

4.2.3 Comfort

4.2.3.1 The suit system shall provide users with a level of comfort consistent with the level of protection against hazards for which it is provided, the ambient conditions, the level of the user’s activity, and the anticipated duration of use of the protective clothing.

4.2.3.2 If applicable, the suit system shall be made of materials with low water vapour resistance and/or high air permeability and/or shall be sufficiently ventilated to minimize discomfort and thermal stress.

4.2.3.3 The suit system that imposes significant ergonomic burdens such as heat stress, or is inherently uncomfortable because of the need to provide adequate protection, should be accompanied by specific advice or warnings in the information supplied by the manufacturer. Specific advice on the appropriate duration for continuous use of the clothing in the intended application(s) should be given.

4.2.3DV D2 *Modification of clause 4.2.3 by deleting*

4.3 Accessories

If the suit is provided with accessories, such as a sprayhood, safety harnesses or safety lines, whistles, lights or buddy lines, they shall comply with ISO 12401 and/or ISO 12402-8 and the relevant clauses of this part of ISO 15027.

If the suit is intended to be used without a personal flotation device, the suit shall be provided with a permanently attached whistle and a light.

If the suit is intended to be used with a personal flotation device (PFD), the PFD shall be fitted with a light.

4.3DV D2 *Modification of Clause 4.3 by adding the following:*

4.3DV.1 If any form of hood or sprayhood is fitted to cover the face in whole or in part, it shall comply with ISO 12402-8 and be marked as specified therein. Additional accessories shall be tested as part of the suit system and shall not impair the suit system's performance. This standard does not test the functionality of these additional accessories.

4.3DV.2 Suit systems may be equipped with further accessories. Such accessories shall comply at least with ISO 12402 8 and shall be tested as a system.

4.4 Buddy lines

A buddy line, if provided, shall be made from synthetic cord or webbing and shall be at least 1 500 mm in length. The line shall have attached securely to the free end a releasable means for attachment to another person or object, such as a loop, a snap hook, or a wooden or plastic toggle.

4.4DV D2 *Modification of clause 4.4 first paragraph to revise as follows:*

A buddy line, if provided, shall be made from synthetic cord or webbing and shall be at least 1 500 mm in length. The line shall be attached securely to the suit and have a free end with a releasable means for attachment to another person or object, such as a loop, a snap hook, or a wooden or plastic toggle.

The buddy line, if provided, shall be readily accessible to at least one of the user's gloved hands as confirmed during device testing. The attachment means and line shall be stowed in such a way that they do not create a hazard or affect the normal operation of the immersion suit.

If hardware is provided as an attachment means, it shall not have sharp edges. The assembly shall float in fresh water. Hardware on the buddy line shall either not be broken, or if broken, not expose sharp edges after pull testing. Weathering testing is not required when the buddy line is normally stowed inside a pocket,

If provided, a buddy line of the length provided by the manufacturer shall be tested as indicated for an immersion suit in accordance with ISO 12402-9:2006, 5.5.1.5 and withstand a (750 ± 50) N load for at least 3^{+1}_{0} min without any damage. The force required to separate the buddy line from the suit shall be greater than 750 N and less than 1 500 N. The separation of the buddy line from the immersion suit shall not adversely affect the integrity of the immersion suit. This shall be verified by visual inspection.

The buddy line, if provided, shall be in accordance with ISO 12402-8:2006, 5.4. The buddy line, if provided, shall be marked with "ISO 12402-8", suffixed with the words "buddy line" at least in the official language(s) of the country of destination. Additionally, a marking shall be included on the buddy line or the outside of a pocket in which a buddy line is stowed, in letters at least 12 mm high, with the words "NOT FOR LIFTING" at least in the official language(s) of the country of destination.

4.5 Conspicuity

4.5.1 Colour

4.5.1.1 The colour of the exposed portions (excluding components such as webbing, zips and other fittings) of the suits when deployed in face-up floating position shall be in the colour range from yellow to red and the chromaticity coordinates for non-fluorescent colours shall lie within one of the areas defined in Table 1 and the luminance factor shall exceed the corresponding value in Table 1. The chromaticity coordinates and the luminance factor for fluorescent colours shall comply with Table 2.

The face-up floating position is defined during in-water test according to ISO 15027-3:2012, 3.10.6.3.

4.5.1.1DV D2 *Modification of clause 4.5.1.1 by replacing with the following:*

4.5.1.1DV.1 The colour of the suit systems shall comply with ANSI/UL 1191 section 2.5.

The face-up floating position is defined during in-water test according to ISO 15027-3:2012, 3.10.6.3.

4.5.1.2 The colour of the material samples shall be measured with the procedures defined in CIE 15:2004 with polychromatic illumination D65 and 45/0 geometry and 2° standard observer. The specimen shall have a black underlay with reflectance of less than 0,04. The specimens shall be conditioned for at least 24 h at (20 ± 2) °C and (65 ± 5) % relative humidity. If the test is carried out in other conditions, the test shall be conducted within 5 min after withdrawal from the conditioning atmosphere.

4.5.1.2DV D2 *Modification of clause 4.5.1.2 by deleting.*

4.5.1.3 The colour fastness (dry and wet) of suit material when determined in accordance with ISO 105-A02 shall be resistant to rubbing (wet and dry), when tested in accordance with ISO 105-X12 to at least step 4, and to salt water when tested in accordance with ISO 105 E02 to at least step 4.

4.5.1.3DV D2 *Modification of clause 4.5.1 by deleting clause 4.5.1 and Tables 1 and 2.*

Table 1
Chromaticity coordinates *x* and *y* and luminance factor *β* for yellow, orange and red non-fluorescent colours of suit material

Colour	Chromaticity coordinates		Luminance factor
	x	*y*	β
Yellow	0,389 0,320 0,405 0,500	0,610 0,490 0,400 0,500	> 0,35
Orange	0,500 0,405 0,470 0,600	0,500 0,400 0,330 0,400	> 0,25
Red	0,610 0,470 0,525 0,700	0,400 0,330 0,270 0,300	> 0,15

Table 2
Chromaticity coordinates *x* and *y* and luminance factor *β* for yellow, yellow-orange, orange, orange-red and red fluorescent colours of suit material

Colour	Chromaticity coordinates		Luminance factor
	x	*y*	β
Yellow	0,380 0,320 0,370 0,440	0,610 0,490 0,440 0,550	> 0,60
Fluorescent yellow-orange	0,440 0,370 0,420 0,505	0,550 0,440 0,390 0,490	> 0,50
Fluorescent orange	0,505 0,420 0,460 0,575	0,490 0,390 0,350 0,425	> 0,40
Fluorescent orange-red	0,575 0,460 0,488 0,630	0,425 0,350 0,320 0,360	> 0,30
Fluorescent red	0,630 0,488 0,525 0,695	0,360 0,320 0,280 0,300	> 0,20

4.5.2 Retro-reflective material

A passive light system of retro-reflective material shall be provided. This shall conform to the specification detailed in IMO Resolution A.658(16), Annex 2. If it is the only light system, then a total area of not less than 400 cm^2 shall be provided. At least 100 cm^2 shall be affixed to the hood and in addition at least 250 cm^2 shall be clear of the water and visible in the suit's normal in water position as tested in ISO 15027-3:2012, 3.10.6.4.1. At least one piece of 50 cm^2 shall be affixed to the back of the suit.

4.5.2DV.1 D2 *Modification of clause 4.5.2 by revising first paragraph as follows:*

A passive light system of retro-reflective material shall be provided. This shall conform to the specification detailed in IMO Resolution A.658 (16), Annex 2. If it is the only light system, then a total area of not less than 400 cm^2 shall be provided of which:

- **At least 50 cm^2 shall be affixed to the hood and**
- **At least 200 cm^2 shall be clear of the water and visible in the suit's normal in water position as tested in ISO 15027-3:2012, 3.10.6.4.1, and**
- **At least 100 cm^2 shall be clear of the water and visible when the subject is lying face down in the water, and**
- **At least 25 cm^2 shall be located on each forearm.**

The performance of the retro-reflective material shall not be degraded by the method used to apply it to the suit. Test in accordance with ISO 15027-3:2012, 3.10.6.4.2.

An active light system shall be provided if the abandonment suit is intended to be used without a PFD. An active light system may be provided if the abandonment suit is intended to be used with a PFD. The active light system shall conform to the standard for emergency lights in ISO 12402-8. When an active light system is provided, the area covered by the passive light system may be reduced, but a minimum of 300 cm^2 of the passive light system should always be provided. At least 100 cm^2 of which should be affixed to the hood and 150 cm^2 clear of the water and visible in the suit's normal in water position as tested in ISO 15027-3:2012, 3.10.6.4. At least one piece of 50 cm^2 shall be affixed to the back of the suit.

4.5.2DV.2 D2 *Modification of clause 4.5.2 by revising third paragraph as follows:*

An active light system shall be provided on the abandonment suit. The light shall be placed in a location that ensures it is effectual and does not impede the user's mobility. The active light system shall conform to the standard for emergency lights in ISO 12402-8.

Alternative systems to provide conspicuity to assist search and rescue operations, such as combinations of active light systems (emergency lights) and passive light systems (retro-reflective material) will be acceptable if they meet the specifications for both emergency lights and retro-reflective material as defined above.

4.5.2DV.3 D2 *Modification of clause 4.5.2 by deleting the fourth paragraph.*

4.6 Foam flotation material

Foam flotation material used to assist the buoyancy performance of the suit system shall comply with ISO 12402-7:2006, 4.8.

4.6DV D2 *Modification of clause 4.6 to replace with the following:*

4.6DV.1 Foam flotation material used to assist the buoyancy performance of the suit system shall comply with ANSI/UL 1191.

4.6DV.2 The buoyancy of the suit system shall be tested in accordance with ISO 15027-3:2012, 3.10.7.1. The buoyancy of the suit system shall not be less than 100 N. In addition, the difference between the initial measurements and the measurement after 24 h shall not exceed 5 % of the original buoyancy.

4.7 Flammability

When tested in accordance with ISO 15027-3:2012, 3.5, the abandonment suit material shall not sustain burning nor continue melting 6 s after being removed from the flames.

4.7DV D2 *Modification of clause 4.7 to replace with the following:*

When tested in accordance with ISO 15027-3, 3.5, the suit system and storage bag materials shall not sustain burning nor continue melting 6 s after being removed from the flames.

4.8 Temperature cycling

The suit system shall be resistant to damage caused by changes in ambient temperature.

After temperature cycling and donning in accordance with ISO 15027-3:2012, 3.9, the suit system shall show no visible damage to the external and internal construction components.

4.8DV D2 *Modification of clause 4.8 by revising second paragraph as follows:*

After temperature cycling and donning in accordance with ISO 15027-3, 3.9, the suit system shall show no inspected damage (ie. should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.) to the external and internal construction components.

Additionally after temperature cycling and donning, dry suits shall be subjected to the leak test in accordance with ISO 15027-3:2012, 3.7.

4.9 Leakage

The leakage of a dry abandonment suit system during jumping shall be measured in accordance with ISO 15027-3:2012, 3.7.1 and the mass of measured water shall not exceed 500 g.

The leakage of a dry abandonment suit system during swimming shall also be measured in accordance with ISO 15027-3:2012, 3.7.2 and the mass of measured water shall not exceed 200 g.

4.10 Thermal protection in water

The suit system with the underclothing specified by the manufacturer or with standard underclothing according to ISO 15027-3:2012, 3.8.1.3 shall provide the user with thermal protection in a hydrostatical compressed state as defined by its flotation position. The thermal insulation of the dry underclothing shall be no more than 1 Clo, measured with the thermal manikin in air. This part of ISO 15027 recognizes the need for different levels of thermal protection depending upon the water temperature in which the suit will be used. The conditions of thermal protection are shown in Table 3. Testing shall be in accordance with ISO 15027-3:2012, 3.8.

None of the six human test subjects' core temperatures shall fall more than 2 °C. Each human test subject's skin temperature shall not be lower than 10 °C for a time period of more than 15 min. If either of these two requirements is not fulfilled, the suit system shall be deemed to have failed.

NOTE See Annex A for more information on thermal protection time.

Table 3
Test conditions for the different suit performance levels

	Suit performance level[a]			
	A	B	C	D
Period of immersion (h)	6	4	2	2
Water temperature (°C)	2	2	5	10
Tests are performed in calm water. Rough conditions (e.g. wind, waves) will decrease the stated period of immersion.				

Table 3DV D2 *Modification of Table 3 by replacing with Table 3DV.1:*

Table 3DV.1
Test conditions for the different suit performance levels

	Suit performance level				
	A		B	C	D
	2	3			
Duration (hr)	6		4	2	2
Temp (°C)	2		2	5	10

There are two options for measuring thermal protection provided that the results are equivalent:

a) using a thermal manikin, in accordance with ISO 15027-3:2012, 3.8.1;

The validation of the thermal manikin test results shall be accompanied by an exchange of experience between the manikin testing laboratories based on round robin testing, and the correlation of results between the tests with human test subject and manikin.

b) using human test subjects, in accordance with ISO 15027-3:2012, 3.8.2.

4.10DV D2 *Modification of clause 4.10 by replacing item (a) as follows:*

a) using a thermal manikin, in accordance with ISO 15027-3, 3.8.1;

The validation of the thermal manikin test results shall be accompanied by an exchange of experience between the manikin testing laboratories based on interlaboratory round robin testing, and the correlation of results between the tests with human test subject and manikin.

4.11 Performance requirements

4.11.1 Walking

A user wearing the suit system correctly donned shall be able to walk easily as tested in accordance with ISO 15027-3:2012, 3.10.3.2.

4.11.2 Climbing

A user wearing the suit system correctly donned shall be able to climb freely as tested in accordance with ISO 15027-3:2012, 3.10.4.2.

4.11.3 Donning

The suit system shall be donned with all primary closures secured and any inflatable chambers inflated, if fitted. The donning shall be tested in accordance with ISO 15027-3:2012, 3.10.2.1 a) without any damage or impairment to the performance of the suit. The donning at (20 ± 2) °C shall be performed within 2 min. The donning at (– 30 ± 2) °C shall be performed within 5 min. When the marking according to 5 c) 1) specifies the suit to be worn with a personal flotation device (PFD), the donning shall be performed with the uninflated PFD.

4.11.3DV D2 *Modification of clause 4.11.3 to replace with the following:*

4.11.3DV.1 The suit system shall be donned with all primary closures secured and any inflatable chambers inflated, if fitted. The donning shall be tested in accordance with ISO 15027-3, 3.10.2.1. Each test subject shall unpack, don and fully secure the suit system within two minutes at an air temperature of (20 ± 2) °C. There shall be no damage to the suit system after donning.

4.11.3DV.2 For cold donning, each test subject shall unpack, don and fully secure the preconditioned suit system within five minutes at room temperature.

4.11.3DV.3 There shall be no damage to the suit system after cold donning.

4.11.4 Dexterity and mobility

The suit system, when correctly donned and adjusted, shall not prevent the user from bending over (without squatting), picking up a rope, passing it around the waist and tying a double overhand knot in front of the body, picking up a pencil and writing something, when tested in accordance with ISO 15027-3:2012, 3.10.5.1.

4.11.4DV D2 *Modification of clause 4.11.4 to replace with the following:*

The suit system, when correctly donned and adjusted, shall not inhibit dexterity and mobility when tested in accordance with ISO 15027-3, 3.10.5.1 and 3.10.5.2.

4.11.5 Hand protection

A user wearing a suit system correctly donned shall be able to remove the permanently attached (e.g. by a cord) hand protection from its stowed position and don it when tested in accordance with ISO 15027-3:2012, 3.10.6.2.2.

4.11.6 Jumping

A user wearing a suit system correctly donned shall be able to jump vertically feet first into water from a height of ($4{,}5^{+0.5}_{-0}$) m without any operational damage to the suit system or injury to the user, when tested in accordance with ISO 15027-3:2012, 3.10.6.1. The leakage of an abandonment suit system during the jump shall be measured in accordance with ISO 15027-3:2012, 3.7.1 and the mass of measured water shall not exceed 500 g and shall be used as threshold value for the thermal test in accordance with ISO 15027-3:2012, 3.8. The user shall be able to secure any secondary suit closures (if fitted) within 2 min of entering the water. This shall be tested in accordance with ISO 15027-3:2012, 3.10.6.2.1. The suit shall not be damaged or dislodged in any way by the jump.

4.11.6DV D2 *Modification of clause 4.11.6 to replace with the following:*

A user wearing a suit system correctly donned shall be able to jump vertically feet first into water from a height of ($4{,}5^{+0.5}_{-0}$) m without any operational damage to the suit system or injury to the user, when tested in accordance with ISO 15027-3, 3.10.6.1. The leakage of an abandonment suit system during the jump shall be measured in accordance with ISO 15027-3, 3.7.1 and the mass of measured water shall not exceed value from 4.9 and shall be used as threshold value for the thermal test in accordance with ISO 15027-3, 3.8. The user shall be able to secure any secondary suit closures (if fitted) within 2 min of entering the water. This shall be tested in accordance with ISO 15027-3, 3.10.6.2.1. The suit system shall not be damaged or dislodged in any way by the jump.

4.11.7 Boarding a platform

A user wearing the suit system correctly donned, with both primary and secondary (if fitted) closure systems secured, shall be able to swim and to board a platform. This shall be tested in accordance with ISO 15027-3:2012, 3.10.6.6.

4.11.8 Flotation and righting

A user wearing the suit system with a personal flotation device (PFD), if required, shall be able to actively turn face up in the water within 5 s and to remain in that position without any movement from the user. The suit system shall be correctly donned and vented in accordance with the manufacturer's instructions. The PFD shall be in accordance with the relevant part of ISO 12402 as recommended by the manufacturer.

The suit system shall provide a freeboard of not less than 120 mm when tested in accordance with ISO 12402-9:2006, 5.6.2. This may be provided by a PFD specified by the manufacturer. Where the suit system is claimed to provide flotation without a PFD, an auxiliary means of buoyancy such as an orally

inflated bladder may be used to obtain this freeboard, provided that the freeboard obtained without the auxiliary means of buoyancy is at least 50 mm.

4.11.9 Field of vision

The suit system, when correctly donned and adjusted, shall not prevent the user from having an acceptable field of vision, tested in accordance with ISO 15027-3:2012, 3.10.6.5. With the heads of the sitting or standing human test subjects in fixed position, the lateral and vertical field of vision shall be at least 120° when wearing the immersion suit correctly donned and adjusted, when tested in accordance with ISO 15027-3:2012, 3.10.6.5.

4.12 Requirements on materials, fabrics and components

4.12DV D2 *Modification of title of clause 4.12 to replace with the following:*

Requirements on materials, fabrics, components and suit systems

4.12.1 Fuel resistance

Samples of material, fabrics and components of an abandonment suit shall withstand the tests in accordance with ISO 15027-3:2012, 3.4 after having been submitted to the temperature cycling in accordance with ISO 15027-3:2012, 3.9.

After the fuel resistance test, the tensile seam strength shall be at least 150 N in accordance with ISO 13935-2.

4.12.1DV D2 *Modification of clause 4.12.1 to add the following:*

The leakage of a dry abandonment suit system after being immersed in diesel oil shall be measured in accordance with ISO 15027-3, 3.4 and the mass of measured water shall not exceed 200 g.

4.12.2 Tensile strength of seams

The tensile strength shall be of at least 300 N per 25 mm width. The tensile strength shall be measured on separate samples using the grab method given in ISO 13935-2, using specimens of at least 60 mm width and with at least 100 mm of material on each side of the test point, with four similar seams for each type of seam including the seam between fastening devices (including zip fasteners) and fabric.

4.12.3 Coated fabrics

Coated fabrics shall comply with the following requirements.

a) Coating adhesion shall be tested in accordance with ISO 2411:2000 at 100 mm/min, and shall be not less than 50 N per 50 mm width.

b) Coating adhesion shall also be tested when wet following ageing in accordance with ISO 188, with an exposure of (336,0 ± 0,5) h in fresh water at (70,0 ± 1,0) °C, following which the method in ISO 2411:2000 shall be applied at 100 mm/min, and shall not be less than 40 N per 50 mm width.

c) Tear strength shall be tested in accordance with ISO 4674-1:2003, method A, and shall not be less than 25 N.

d) Resistance to flex cracking shall be tested in accordance with ISO 7854:1995, method A using 9 000 flex cycles, following which there shall be no visible cracking or deterioration.

e) Breaking strength shall be tested in accordance with ISO 1421:1998, Method 1 following conditioning of (24,0 ± 0,5) h at room temperature, and shall be not less than 200 N per 50 mm width when tested.

f) Breaking strength shall be tested in accordance with ISO 1421:1998, Method 1 following conditioning of (24,0 ± 0,5) h immersion in fresh water at room temperature, and shall be not less than 200 N per 50 mm width when tested.

g) Elongation at break shall be tested in accordance with ISO 1421:1998, Method 1 following conditioning of (24,0 ± 0,5) h at room temperature, and shall be not more than 60 %.

h) Elongation at break shall be tested in accordance with ISO 1421:1998, Method 1 following conditioning of (24,0 ± 0,5) h immersion in fresh water at room temperature, and shall be not more than 60 %.

4.12.4 Other fabrics

Other fabrics used in the construction of the component the failure of which would render the entire item non-conformant with this part of ISO 15027, shall comply with the following requirements.

a) Breaking strength shall be tested in accordance with ISO 13934-1, following (24,0 ± 0,5) h conditioning at room temperature, and shall be not less than 10 N/mm.

b) Elongation at break shall be tested in accordance with ISO 13934-1, following (24,0 ± 0,5) h conditioning at room temperature, and shall be not more than 60 %.

c) Tear resistance shall be tested in accordance with ISO 13937-4, tensile speed (100 ± 10) mm/min, with a pretension of 2 N for materials of up to 200 g/m^2, 5 N for materials of over 200 g/m^2 and up to 500 g/m^2, and 10 N for materials of over 500 g/m^2, and shall be not less than 25 N. The mass per unit area of a fabric shall be measured in accordance with ISO 3801:1977, method 5.

4.12.5 Metal components

4.12.5.1 When tested in accordance with ISO 9227 using the neutral salt spray (NSS) for a period of 96 h, metal components shall not be significantly affected by corrosion. After the test the components shall still operate as designed.

4.12.5.2 No component shall affect a magnetic compass of a type commonly used in small boats by more than 1 degree, when placed at a distance of 500 mm from it. Test in accordance with ISO 12402-9:2006, 5.4.

4.12DV D2 ***Modification of entire clause 4.12 to replace with the following:***

Materials, fabrics and components used in suit systems shall comply with ANSI/UL 1191.

The suit system shall not affect a magnetic compass of a type commonly used in small boats by more than 1 degree, when placed at a distance of 500 mm from it. Test in accordance with ISO 12402-9:2006, 5.4.

4.13DV D2 *Modification of clause 4 to add new clause 4.13DV.1*

4.13DV.1 Strength

4.13DV.1.1 The strength of the suit shall be tested in accordance with ISO 15027-3, 3.10.8. No damage, such as separated or broken seams, broken zippers, buckles, and webbing shall occur. The load shall be no less than 1350 N.

4.13DV.1.2 The lifting loop shall be tested in accordance with ISO 15027-3, 3.10.9. No damage, such as separated or broken seams, broken zippers, buckles, and webbing shall occur. The load shall be no less than 3200 N.

5 Marking

Each abandonment suit system shall be permanently and legibly marked with the following [which shall be given at least in the official language(s) of the country of destination]:

a) identification of the manufacturer;

b) water temperature in which it is designed to operate;

c) one or more of the following statements as applicable:

a) "WARNING: This suit system has to be worn with a personal flotation device according to ISO 12402-X with an emergency light."

NOTE Replace "X" by the relevant part of ISO 12402 for the personal flotation device recommended by the manufacturer.

The manufacturer shall state the specific type(s) of PFD(s) (inflatable and/or inherent) to be worn with the suit system in order to consider the compatibility.

b) "This suit system itself meets the performance requirements specified in ISO 12402-X in addition to ISO 15027-2."

NOTE Replace "X" by the relevant part of ISO 12402

c) "WARNING: This suit system will not turn an unconscious user to the face-up position."

d) type of suit, being a dry- or wet-type suit system;

e) recommended size range, height and chest measurements in line with the recommendations laid down in EN 340;

f) storage, care, cleaning and maintenance instructions;

g) simple donning and use instructions;

h) manufacturer's model designation, and quarter (or month) and year of manufacture and an individual serial number for the suit or batch of suits. Months are to be given as Arabic numbers (1...12), and quarters as Roman numbers (I...IV) in order starting from 1st January;

i) numbers of the Standards to which it conforms;

j) pictograms or words indicating other risks catered for;

k) compatibility with safety harnesses and other equipment as relevant;